



Research Paper

Economics of wheat production

■ P.A. AGAM, S.G. TALE AND S.S. THAKARE

See end of the paper for authors' affiliations

Correspondence to :

S.S. THAKARE

Department of Agriculture
Economics and Statistics,
Shri Shivaji Agriculture
College, AMRAVATI (M.S.)
INDIA

Paper History :

Received : 26.07.2016;

Revised : 01.01.2017;

Accepted : 10.01.2017

ABSTRACT : In this study, an attempt has been made to study analysis of yield gap in wheat in Amravati district with view to study the economics of wheat production and resource use efficiency. The study was based on primary data on input used and there upon costs was collected from two tehsils viz., Amravati and Morshi and from each tahsil 45 samples were selected. Per hectare input utilization for wheat indicated that the medium farmers were used higher inputs as compared to other farm size group of farmers. Per hectare total cost of cultivation of wheat for the sample as whole was Rs. 37235.99 per hectare, gross return from wheat at overall level was Rs. 63861.60. The input-output relationship at overall size group was 1.76 at Cost 'C' For the study resource use efficiency of wheat, Cobb-Douglas production function was used. In the overall group resources seed, plant protection and area were significant. Marginal value of product to factor cost ratio at overall group, in case of Human labour, bullock labour and seed was positive and more than one and in case of machine labour, fertilizer, manure, plant protection and area it was negative and less than one.

KEY WORDS : Cost of cultivation, Gross return, Resource use efficiency, Wheat

HOW TO CITE THIS PAPER : Agam, P.A., Tale, S.G. and Thakare, S.S. (2017). Economics of wheat production. *Internat. Res. J. Agric. Eco. & Stat.*, 8 (1) : 1-7, DOI : 10.15740/HAS/IRJAES/8.1/1-7.

INTRODUCTION :

Wheat is the most important food grain of India and is the staple food of millions of Indians, particularly in the northern and north-western parts of the country. Wheat occupying 28 million ha with production of 78.60 million tonnes with an average productivity of 2802 kg per ha. Wheat compare well with other cereal in nutritive value. It has good nutrition of profile with 12.1 per cent protein, 1.8 per cent lipids, 1.8 per cent ash, 2.0 per cent educing sugar, 6.7 per cent pentose, 59.2 per cent starch good source of mineral of vitamin and nicotinic acid.

Wheat (*Triticum* spp.) is a cereal grain, originally from the South West Asia, but now cultivated worldwide. It has been described as the "King of Cereal". India has second rank in world wheat production In 2012-13 the

world production of wheat was 654 (Million tons), In India area was 29647 (000'ha), production 92458 (000't), productivity 3119 (kg/ha) and India share out of world production is 13.15 per cent. In Maharashtra In 2012-13, Area, Production and Productivity of wheat in Amravati district was 36100 ha, 71500 tonns and 1981 kg/ha, respectively. Wheat is the world's most widely cultivated food crop. It is eaten in various forms by more than one thousand million human beings in the world.

The specific objectives have been undertaken as follows :

- To study the socio-economic characteristics of selected farmers
- To study the resource use efficiency in wheat production

MATERIALS AND METHODS :

Selection of area :

Two Tehsil from Amravati district viz., Amravati and Morshi were selected purposively and 45 samples each from Amravati and Morshi Tehsil were selected for present study. In all 90 farmers were selected.

Collection of data :

The study was based on primary data collected from Amravati district.

Primary data :

The primary data on inputs used and yield obtained from wheat were collected from selected farmers by survey method. The data on inputs used and yield obtained from demonstration plot were collected from research unit / station. In all 90 farmers were selected for the study. The data pertain to the year 2012-13. The selected farmers were stratified into three groups on the basis of size of holdings viz., small farmers (*i.e.* 45) with the size of holding (0.01 ha to 2.00 ha), medium farmers (*i.e.* 26) with (2.01 to 4.00 ha) and large farmers (*i.e.* 19) (4.01 ha and above).

Economics of wheat production :

Economics of wheat production was worked out by using standard cost concepts.

Cost 'A' :

It is the actual paid out cost incurred by the cultivator. This cost comprise of the expenditure incurred by the farmers in cash as well kind for the cultivation of wheat in like, Hired human labour, Hired and owned bullock labour, Machine labour, Seed, Manure, Fertilizer, Plant protection measures adopted, Incidental charges, Depreciation, Land revenue and other taxes, Miscellaneous charges, Interest on working capital @ 6 per cent per annum.

Cost 'B' :

Cost B = Cost A + Rental value of owned land (@ of 1/6 of the value of gross produce – land Revenue) + interest on fixed capital @ of 10 per cent per annum.

Cost 'C' :

Total of direct as well indirect cost including value

of family labour constituents Cost C. It is calculated by adding imputed value of family labour to Cost B.

Cost C = Cost B + imputed value of family labour.

Gross and net return :

Gross return:

Return obtained from the sale of crop output *i.e.* main products and by product.

Net return :

Net return was computed at different cost concepts *i.e.* Cost A, cost B and Cost C by deducting respective costs from the gross returns.

Input output ratio :

The input-output relationship was work out on the basis of standard cost concepts.

Input-Output ratio at Cost 'A', Cost 'B', Cost 'C':

$$\text{Input - Output ratio} = \frac{\text{Gross income}}{\text{Respective cost}}$$

Resource use efficiency of wheat :

The resource use efficiency of wheat was workout by using Linear as well as Cobb-Douglas production function.

$$\text{Linear} = Y = a + b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4 + b_5x_5 + b_6x_6 + b_7x_7 + b_8x_8$$

Cobb-Douglas :

$$Y = ax_1^{b_1} x_2^{b_2} x_3^{b_3} x_4^{b_4} x_5^{b_5} x_6^{b_6} x_7^{b_7} x_8^{b_8} U$$

where

y = Yield q/ ha

a = Constant intercept which indicated the level of output when zero inputs are used.

$b_1 - b_n$ = Regression co-efficient of the respective factors fitted as below.

X_1 = Human labour (Days/ha)

X_2 = Bullock pair (Days/ha)

X_3 = Machinery charges (Hr/ha)

X_4 = Seeds (kg/ha)

X_5 = Fertilizers (kg/ha)

X_6 = Manure (CL/ha)

X_7 = Plant protection measures (Rs./ha)

X_8 = Area (ha)

Marginal value of product to factor cost ratio :

$$MVP = b_i \cdot \frac{\bar{Y} \text{ (Geometric mean)}}{\bar{X}_i \text{ (Geometric mean)}}$$

where,

\bar{Y} = Geometric mean of Y

b_i = The elasticity of output with respect to input X_i

\bar{X}_i = Geometric mean of X_i

RESULTS AND DATA ANALYSIS :

The results obtained from the present investigation as well as relevant discussion have been summarized under following heads :

Economics of wheat production :*Per hectare input utilization of wheat :*

Farm product is the result of different input factors utilized in the process of production. A study of input utilization helps to determine the profitability of crop enterprise. Realizing the importance of cost studies, an attempt has been made to study the inputs utilized and

cost associated with them for wheat in the study area. Results obtained are presented in Table 1. The Table 1 depicts information on the use of inputs in wheat production. The study reveals that per hectare use of human labour for wheat sample as a whole was 46.49 *i.e.* 47 man days while total bullock labour was 3.36 days per hectare.

At overall level, the use of fertilizer was observed to be 191.66 kg N, P, and K per hectare.

Inter-group comparison revealed that with increase in size of holding, there was decrease in per hectare use of human labour. Result presented in the Table 1 revealed that the level of fertilizer use increase with increase of size of holding. The level of fertilizer use by small farmers was near about same medium and large farmers. However, the use of bullock labour was observed more on medium farmers followed by small farmers and large farmers. Comparison of input use between different size groups indicated that per hectare use of human labour and fertilizer was highest in small size group and bullock labour was highest in medium size group. The yield of wheat was highest *i.e.* 34.50 quintals per hectare in small size group of holding and lowest in large size group *i.e.*

Table 1 : Per hectare input utilization of wheat

Sr. No.	Input	Unit	Physical quantity			
			Small	Medium	Large	Overall
1.	Total human labour					
	Male	Days	25.34	23.30	18.77	23.37
	Female	Days	25.89	21.11	19.29	23.12
	Total		51.23	44.41	38.06	46.49
2.	Hired human labour					
	Male	Days	12.92	12.15	9.60	12.00
	Female	Days	13.30	10.64	9.91	11.82
3.	Bullock labour	Days	3.56	3.64	2.43	3.35
4.	Machine labour	Hrs	3.90	3.82	2.65	3.61
5.	Seeds	Kg	120.21	91.98	68.68	114.22
6.	Manure	Cl.	4.29	1.68	1.45	2.94
7.	Fertilizer					
	N	Kg	124.07	124.51	124.89	120.88
	P	Kg	79.86	50.08	57.81	42.59
	K	Kg	32.93	11.16	23.20	24.06
	Total		236.86	185.75	205.91	191.66
8.	Family labour					
	Male	Days	12.42	11.15	9.17	11.37
	Female	Days	12.59	10.47	9.38	11.30
9.	Yield					
	Main produce	Qtls.	34.50	33.81	32.40	33.86
	By-produce	Qtls.	86.26	84.52	81.00	84.65

(32.40 q/ ha).

Cost of cultivation of wheat :

The per hectare cost of cultivation of wheat was worked out by using standard cost concepts explained in methodology. The estimation of cost help us to know the profitability of a particular crop enterprise. For the purpose of crop planning, more emphasis given on Cost 'A' *i.e.* direct cost. Per hectare item wise cost for wheat production worked out and presented in Table 2

It could be seen from Table 2 that the per hectare total cost of cultivation of wheat for the sample as a whole was Rs.37235.99. Among the different items of expenditure human labour accounted highest share of the total Cost *i.e.* (15.62%). The proportion of other item of expenditure were bullock labour (3.60%), seeds (12.52%), fertilizer (6.29%) and interest on working capital (4.70%) and fixed capital (7.47%), respectively. The proportion of expenditure on irrigation was (5.95%). The proportion of expenditure on rental value of land

(27.86%) which was highest share of total cost of cultivation. The per hectare total cost of cultivation *i.e.* Cost 'C' ranges from Rs. 39730.44/- in small size group to Rs. 35578.12/-in medium size group to Rs. 33596.44/- in large size group. Higher total cost on small size farm was obviously due to higher use of inputs.

At overall level Cost 'A' and Cost 'B' per hectare was Rs.21244.78 and Rs.34399.90, respectively which was 57.05 per cent and 96.14 per cent of total Cost *i.e.* Cost 'C'.

Economics of production of wheat :

Studies on economics of production of wheat help to understand the profitability and selection of appropriate crop on the farm. The data on cost and returns from wheat is presented in the following Table 3

It could be revealed from Table 3 that the gross return from wheat production for overall average size group was Rs. 63861.60 per hectare. The gross return ranged between Rs.61792.54 in large size group to Rs.

Table 2 : Per hectare cost of cultivation of wheat

Sr. No.	Particulars	Group				(Rs./ha)
		Small	Medium	Large	Overall	
1.	Hired human labour					
	Male	1938.61 (4.88)	1823.07 (5.12)	1440.60 (4.29)	1800.09 (4.83)	
	Female	1330.83 (3.35)	1064.42 (2.99)	991.13 (2.95)	1182.16 (3.17)	
2.	Bullock labour	1427.40 (3.59)	1457.05 (4.10)	974.06 (2.90)	1340.26 (3.60)	
3.	Machine labour	1952.77 (4.92)	1912.98 (5.38)	1327.85 (3.95)	1809.35 (4.86)	
4.	Seeds	4808.70 (12.10)	4453.84 (12.52)	4158.92 (12.38)	4569.01 (12.27)	
5.	Plant protection	805.75 (2.03)	679.67 (1.91)	620.38 (1.85)	730.19 (1.96)	
6.	Manure	3006.11 (7.57)	1180.12 (3.32)	1016.22 (3.02)	2058.52 (5.53)	
7.	Fertilizer					
	N	744.44 (1.87)	747.11 (2.10)	749.34 (2.23)	746.25 (2.00)	
	P	1129 (2.84)	1201.92 (3.38)	1387.59 (4.13)	1009.63 (2.71)	
	K	790.33 (1.99)	233.46 (0.66)	556.95 (1.66)	590.19 (1.58)	
8.	Repairing charges	230.05 (0.58)	320.47 (0.90)	453.40 (1.35)	303.33 (0.81)	
9.	Irrigation charges	2511.48 (6.32)	2042.30 (5.74)	1747.05 (5.20)	2214.56 (5.95)	
10.	Land revenue	186.63 (0.47)	198.44 (0.56)	561.49 (1.67)	269.18 (0.72)	
11.	Depreciation	1439.79 (3.62)	1837.49 (5.16)	2366.91 (7.05)	1750.41 (4.70)	
12.	Interest on working capital @ 6 % per annum	1025.61 (2.58)	776.04 (2.18)	637.66 (1.90)	871.41 (4.70)	
13.	Cost 'A'	23327.55 (58.71)	19694.98 (55.36)	18432.65 (54.86)	21244.78 (57.05)	
14.	Rental value of land =1/6 th of gross produce - land revenue	10520.05 (26.48)	10587.99 (29.76)	9737.26 (28.98)	10374.40 (27.86)	
15.	Interest on fixed capital	2760.10 (6.95)	2574.15 (7.24)	3112.32 (9.26)	2780.74 (7.47)	
16.	Cost 'B'	36607.79 (92.14)	32857.13 (92.44)	31282.25 (93.11)	34399.90 (92.38)	
17.	Imputed value of family labour					
	Male	1863.19 (4.69)	1673.55 (4.70)	1376.12 (4.10)	1705.59 (4.58)	
	Female	1259.53 (3.17)	1047.43 (2.94)	938.06 (2.79)	1130.40 (3.04)	
18.	Cost 'C'	39730.44 (100)	35578.12 (100)	33596.44 (100)	37235.99 (100)	

64718.59 in medium size group. The overall cost 'A', cost 'B' and cost 'C' were Rs.21244.8, Rs.34399.90 and Rs. 37235.90, respectively. Profit at Cost 'A' for overall size group from wheat cultivation was Rs.42616.80 and at Cost C it was Rs. 26625.70.

Input-output relationship of wheat :

Efficiency of investment in the cultivation of crop is judged by calculating output – input ratio. The result are presented in Table 4.

An evident from Table 4 that the output-input ratios for overall size group at Cost 'A', Cost 'B' and Cost 'C' were 3.20, 1.91 and 1.76, respectively. The output-input ratio calculated at cost A and cost C were greater than unity in all the size groups indicating there by the

production of wheat was profitable. Output-input ratio at cost 'A' was highest i.e. 3.52 in large size group followed by medium (3.45) and medium (2.92) size group.

Thus, the study concludes that the wheat is most profitable crop in Amravati district

Production function analysis :

Resource use efficiency :

One of the objectives of present investigation was to study the resource use efficiency in wheat crop. This objective was accomplished through the production function analysis. The production function framework is often used to determine optimal quantities of inputs that's the cultivators use in the production process

Out of two, linear regression model and Cobb-

Table 3 : Costs and return from wheat

Sr. No.	Particulars	Size group			Overall
		Small	Medium	Large	
1.	Yield	34.50	33.81	32.40	33.86
2.	Gross return	64240.09	64718.59	61792.54	63861.60
3.	Price	1862.03	1914.18	1907.17	1886.04
4.	Cost 'A'	23327.55	19694.99	18432.66	21244.8
5.	Cost 'B'	36607.7	32857.13	31282.25	34399.9
6.	Cost 'C'	39730.44	35578.12	33596.44	37235.99
7.	Net return over				
	Cost 'A'	40912.53	45023.6	43359.89	42616.8
	Cost 'B'	27632.39	31861.46	30510.3	29461.7
	Cost 'C'	24509.66	29140.47	28196.11	26625.7

Table 4 : Input-output relationship in wheat

Sr. No.	Particulars	Small	Medium	Large	Overall
1.	Cost 'A'	2.92	3.45	3.52	3.20
2.	Cost 'B'	1.80	2.02	2.00	1.91
3.	Cost 'C'	1.66	1.87	1.87	1.76

Table 5 : Resource use efficiency in wheat

Sr. No.	Particulars	Size group			Overall
		Small	Medium	Large	
1.	Intercept	1.18	1.17	-0.13	1.20
2.	Human labour (X ₁)	0.26*	0.09	0.29	0.11
3.	Bullock labour (X ₂)	0.02	-0.10	-0.20	0.008
4.	Machine labour (X ₃)	-0.08	0.12	0.60**	-0.01
5.	Seed (X ₄)	0.01	0.20*	0.65**	0.08***
6.	Fertilizer (X ₅)	-0.1	-0.07	-0.06	-0.002
7.	Manure (X ₆)	-0.008	0.03*	-0.06	-0.009
8.	Plant protection (X ₇)	0.04	-0.04	0.009	-0.01**
9.	Area (X ₈)	-0.2**	-0.18	0.13	-0.13**
	R ²	0.59	0.60	0.66	0.53

*, ** and *** indicate significance of values at P=0.10, 0.05 and 0.01, respectively

Douglas model. On the basis of number of significant variables, desired signs of estimated regression co-efficient and higher R^2 values, Cobb-Douglas production function was estimated on per farm basis for small, medium and large size group. The elasticity of production and related parameters are presented in Table 5.

It is observed from the table, that the explanatory variables included in the production process have explained almost the variation in input for small, medium and large for the sample as a whole.

In small size group, the regression co-efficient of human labour, bullock labour and machine labour is significant at 5 per cent level of significance.

In Cobb-Douglas production function the regression co-efficient directly shows the production function elasticity. Hence the regression co-efficient of human labour, bullock labour and machine labour that increases by one unit in presence of contributing variable of wheat production increase by one unit.

In small size group, the regression co-efficient of human labour and area is significant at 5 per cent level of significance and left of them variable are non significant is small size group.

In Cobb-Douglas production function the regression co-efficient directly shows the production function elasticity hence, the regression co-efficient of human labour machine labour that increases by one unit in presence of contributing variable of wheat production increase by one unit.

In medium size group seed and manure is significant at 10 per cent level as other variable are non-significant at medium size group.

In large size machine labour and seed is significant at 5 per cent level and remaining at them is non-significant.

At overall size seed, plant protection and area are significant 10 per cent and 5 per cent level remaining variable of wheat. Production could not give the desired

profit from wheat.

Marginal value product to factor cost ratio :

Marginal value of product to factor cost ratio is the measure of resource use efficiency. The ratio of MVP to factor cost indicates the optimum resource use efficiency of particular input. The marginal value product of each input factor was worked out and compared with prices of respected input in respect of small, medium, large and overall group.

In overall group the marginal value of product to factor cost ratio of human labour, machine labour and fertilizer was positive but less than one mean there is a scope to increase the level of these inputs in wheat production.

In small, medium and large farmer the MVP of human labour and seed to factor cost ratio of a variable are positive.

In medium size farmers Bullock labour (1.73) and machine labour (2.27), (2.13) large farmer. Machine labour and area of large farmer 3.93 were more than unity indicating suboptimal use of these resources.

The marginal value of product to factor cost ratio for fertilizers in small, medium, large and overall level are negative indicating the over use of these resources and there is no scope increase the use of these resources in wheat production. The MVP of plant protection in medium farmers (-0.002) and at overall (-0.007) shows excesses used. In large farmers, bullock labour (-2.76) negative and in small farmers, machine labour also shows (-0.12) negative value indicated the excess uses of these resources in wheat production.

Conclusion :

Resource use efficiency worked out with the help of Cobb-Douglas production function. In overall group the regression co-efficient of seed, plant protection and

Table 6 : Marginal value of product to factor cost ratio

Sr. No.	Variables	Small	Medium	Large	Overall
1.	Human labour	0.17	0.13	0.25	0.08
2.	Bullock labour	0.33	1.73	-2.76	0.009
3.	Machine labour	-0.79	2.27	2.13	-0.12
4.	Seeds	0.003	0.04	0.20	0.002
5.	Fertilizer	-0.01	-0.02	-0.01	-0.003
6.	Manure	-0.09	-0.17	-1.25	-0.14
7.	Plant production	0.002	-0.002	0.006	-0.007
8.	Area	-11.31	-6.00	3.93	-5.99

area are signi Comparison of inputs used between different size groups indicated that per hectare use of human labour was highest in small size group whereas bullock labour was highest in medium size group and use of seed and manure highest in small size group.

The output-input ratios were greater than unity which indicate that the wheat is profitable crop in Amravati district.

From production function analysis it is concluded that, farmers want to get more profit from wheat crop. They should increase the input used rather than fertilizer, plant protection and machine labour.

It could be concluded that the farmers in study area were not using proper and efficient inputs in wheat production. Hence, there is need for extension efforts to educate them about use of optimum resources and other variable shows non-significant result. In overall group marginal value of product to factor cost ratio of human labour, bullock labour and seed was positive.

Authors' affiliations:

P.A. AGAM AND S.G. TALE, Department of Agriculture Economics and Statistics, Shri Shivaji Agriculture College, AMRAVATI (M.S.) INDIA

LITERATURE CITED :

- Banafar, K.N.S. (2005). Economics of wheat cultivation in Senore district of Madhya Pradesh. *J. Agri. Mktg.*, **48**(3) : 18-22.
- Dwivedi, S. and Singh, N.P. (2000). Resource use efficiency of wheat crop in Agra Dist. *J. Agric. & Sci. Res.*, **36**(1/2) : 14-18.
- Koppad, M.B., Khan, H.S. and Shankarmurthi, H.G. (1997). Resource use efficiency in maize crop in three location of Malaprabha command area (Karnataka state). *Agric. Situ. India*, **45**(54) : 35-36.
- Kumar, A., Gill, J.K. and Sharma, M. (2003). Economics of wheat cultivation at village Baayal Brahman of R.S. Pura block in Jammu district of Jammu and Kashmir.
- Pawar, B.R., Dahiwade, P.M. and Mane, P.S. (2014). Resources use efficiency in wheat production. *Internat. Res. J. Agric. Econ. & Stat.*, **5**(1) : 51-54.
- Shalendra and Singh, G.N. (2001). Economics of production, marketing and storage of wheat in districts Kanpur (Nagar), U.P. *Bihar J. Agric. Mktg.*, **9** (1) : 97-101.
- Singh, A.R.K., Singh, B. Kishor, Gopal and Singh, H. (1991). Economics and marketing of wheat in block Malasa of district Kanpur (Dehat), U.P. (A case Study). *Agril. Mktg.*, **34** (4) : 8-12.

8th
Year
★★★★★ of Excellence ★★★★★